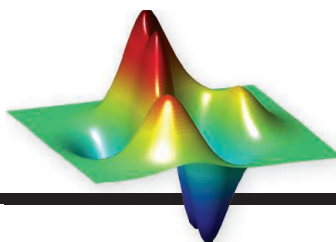


CONTENTS



30 & 61

The twists and turns
to make O₂ from CO₂

3 OCTOBER 2014 • VOLUME 346 • ISSUE 6205

NEWS

IN BRIEF

14 Roundup of the week's news

IN DEPTH

17 WHEN EBOLA PROTECTION FAILS

Repeated cases among health care workers are a puzzle, but more staff and better training may lower risks

By J. Cohen

18 DOUBLE-WHAMMY TSUNAMI?

Japan's 2011 quake may have had a hidden accomplice

By R. Pease

19 INTRUDER FROM THE OORT CLOUD WILL GRAZE MARS

Five spacecraft will have front-row seat for the encounter with comet Siding Spring

By E. Hand

21 EARLY AIDS VIRUS MAY HAVE RIDDEN AFRICA'S RAILS

Genetic study reveals fresh details on HIV's emergence

By J. Cohen

► RESEARCH ARTICLE P. 56

22 BREAKTHROUGH LOST IN COIN TOSS?

A controversial quantum measurement that seems to bend the rules may not be very quantum after all

By A. Cho

FEATURES

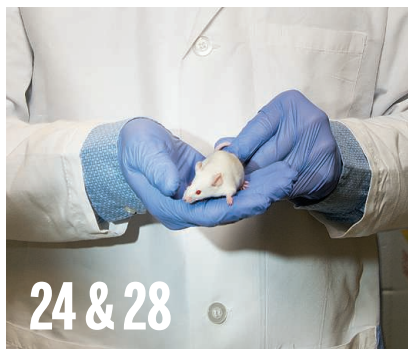
24 THE LITTLEST PATIENT

Cutting-edge mouse models fuel hope for understanding and treating cancer

By J. Couzin-Frankel



21 & 56



24 & 28

28 HOPE IN A MOUSE

Selling personalized mouse models to cancer patients, a firm draws thanks and reproach

By J. Couzin-Frankel

INSIGHTS

PERSPECTIVES

30 HOT MOLECULES—OFF THE BEATEN PATH

Highly excited carbon dioxide dissociates unexpectedly to form molecular oxygen

By A. G. Suits and D. H. Parker

► REPORT P. 61

32 SEAFLOOR SECRETS REVEALED

Satellite data reveal formerly unknown tectonic structures

By C. Hwang and E. T. Y. Chang

► REPORT P. 65

33 HOW LARGE PREDATORS MANAGE THE COST OF HUNTING

For pumas and cheetahs, seeking prey is more energetically costly than the subsequent chase

By J. W. Laundré

► REPORTS PP. 79 & 81

35 HOW TO SURVIVE BEING HOT AND INEBRIATED

Cell membrane integrity and composition are key to making yeast a better biocatalyst

By C. Cheng and K. C. Kao

► REPORTS PP. 71 & 75

36 GOOD BARRIERS MAKE GOOD NEIGHBORS

Cerebrospinal fluid may provide indicators of age-associated decline in brain function

By R. M. Ransohoff

► REPORT P. 89

38 A DOUBLE-EDGED SWORD FOR TROPICAL FORESTS

Contrary to expectation, high-yielding tropical crops may cause forest loss in the tropics

By L. R. Carrasco et al.

40 A NEIGHBORHOOD WATCH UPHOLDS LOCAL IMMUNE PROTECTION

T cells that reside in peripheral tissue create conditions that enable local and broad responses to infection

By F. R. Carbone and T. Gebhardt

► REPORTS PP. 93, 98, & 101

42 PROGRESS IN MEASURING SUBJECTIVE WELL-BEING

Moving toward national indicators and policy evaluations

By A. B. Krueger and A. A. Stone

BOOKS ET AL.

45 THE SOCIAL ROOTS OF RISK

By K. Tierney, reviewed by B. M. Hutter



47

LETTERS

47 NEXTGEN VOICES

DEPARTMENTS

13 EDITORIAL

Building agricultural research

By Donald Kennedy

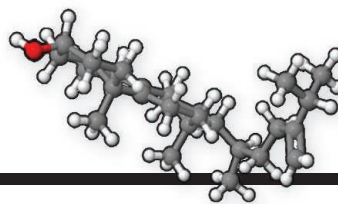
13A WORKING LIFE

A detour for love

By David A. Anderson

Science Staff 10
New Products 109
Science Careers 110

CONTENTS



35 & 75

A molecule that helps yeast beat the heat

3 OCTOBER 2014 • VOLUME 346 • ISSUE 6205

RESEARCH

IN BRIEF

50 From *Science* and other journals

REVIEWS

53 BIONANOTECHNOLOGY

Colloidal nanoparticles as advanced biological sensors *P. D. Howes et al.*

REVIEW SUMMARY; FOR FULL TEXT:
dx.doi.org/10.1126/science.1247390

54 STEM CELL SIGNALING

An integral program for tissue renewal and regeneration: Wnt signaling and stem cell control *H. Clevers et al.*

REVIEW SUMMARY; FOR FULL TEXT:
dx.doi.org/10.1126/science.1248012

RESEARCH ARTICLES

55 PROTEOMICS

Tracking cancer drugs in living cells by thermal profiling of the proteome *M. M. Savitski et al.*

RESEARCH ARTICLE SUMMARY; FOR FULL TEXT:
dx.doi.org/10.1126/science.1255784

56 HIV EPIDEMIOLOGY

The early spread and epidemic ignition of HIV-1 in human populations *N. R. Faria et al.*

► NEWS STORY P. 21

REPORTS

61 PHOTOCHEMISTRY

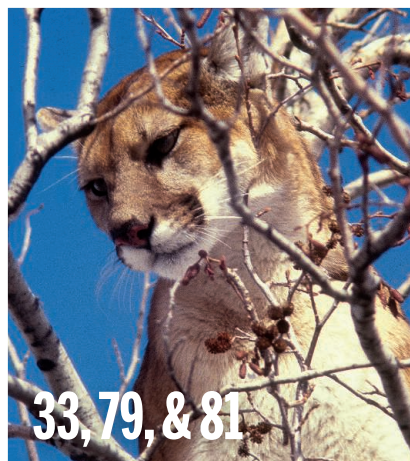
Evidence for direct molecular oxygen production in CO₂ photodissociation *Z. Lu et al.*

► PERSPECTIVE P. 30

65 MARINE GEOPHYSICS

New global marine gravity model from CryoSat-2 and Jason-1 reveals buried tectonic structure *D. T. Sandwell et al.*

► PERSPECTIVE P. 32; PODCAST



67 NANOPHOTONICS

Chiral nanophotonic waveguide interface based on spin-orbit interaction of light *J. Petersen et al.*

71 BIOFUELS

Engineering alcohol tolerance in yeast *F. H. Lam et al.*

► PERSPECTIVE P. 35

75 BIOFUELS

Altered sterol composition renders yeast thermotolerant *L. Caspeta et al.*

► PERSPECTIVE P. 35

MAMMALIAN ENERGETICS

79 Flexible energetics of cheetah hunting strategies provide resistance against kleptoparasitism *D. M. Scantlebury et al.*

81 Instantaneous energetics of puma kills reveal advantage of felid sneak attacks *T. M. Williams et al.*

► PERSPECTIVE P. 33

85 PROSTATE CANCER

Ubiquitylome analysis identifies dysregulation of effector substrates in SPOP-mutant prostate cancer *J.-P. P. Theurillat et al.*

89 AGING

Aging-induced type I interferon response at the choroid plexus negatively affects brain function *K. Baruch et al.*

► PERSPECTIVE P. 36

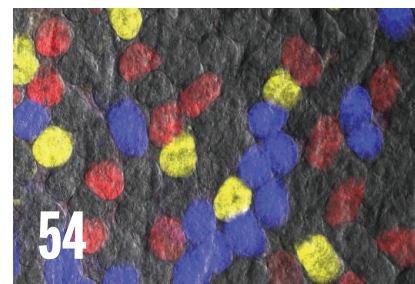
T CELL MEMORY

93 A local macrophage chemokine network sustains protective tissue-resident memory CD4 T cells *N. Iijima and A. Iwasaki*

98 Resident memory CD8 T cells trigger protective innate and adaptive immune responses *J. M. Schenkel et al.*

101 Skin-resident memory CD8⁺ T cells trigger a state of tissue-wide pathogen alert *S. Ariotti et al.*

► PERSPECTIVE P. 40



ON THE COVER



To make mice better mirrors of human cancer, researchers are building “avatars” with the cancer of a particular patient, or engineering mice to spontaneously develop tumors just like people do. The work marks a sea change in cancer biology and is stirring hope that new mouse models will pave the way to more personalized care. See pages 24 and 28.

Photo: Joe McNally

SCIENCE (ISSN 0036-8075) is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1200 New York Avenue, NW, Washington, DC 20005. Periodicals mail postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 2014 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$153 (\$74 allocated to subscription). Domestic institutional subscription (51 issues): \$1282; foreign postage extra: Mexico, Caribbean (surface mail) \$55; other countries (air assist delivery) \$85. First class, airmail, student, and emeritus rates on request. Canadian rates with GST available upon request. GST #1254 88122. Publications Mail Agreement Number 1069624. Printed in the U.S.A. Change of address: Allow 4 weeks, giving old and new addresses and 8-digit account number. Postmaster: Send change of address to AAAS, P.O. Box 96178, Washington, DC 20090-6178. Single-copy sales: \$10.00 current issue, \$15.00 back issue prepaid includes surface postage; bulk rates on request. Authorization to photocopy material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that \$30.00 per article is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923. The identification code for Science is 0036-8075. Science is indexed in the Reader's Guide to Periodical Literature and in several specialized indexes.

Science

346 (6205)

Science **346** (6205), 13-134.

ARTICLE TOOLS

<http://science.sciencemag.org/content/346/6205>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. 2017 © The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works. The title *Science* is a registered trademark of AAAS.